

Claims

What we claim is:

1. A storage system comprising:

a plurality of non-volatile memory cells in an integrated circuit, the plurality of non-volatile memory cells associated with a plurality of flag cells;

means for establishing a current data set including managing data stored in said plurality of flag cells, said current data set indicating which one of said plurality of non-volatile memory cells to write a new value to and which other of said plurality of non-volatile memory cells to read a currently stored value from; and

means for changing said current data set whenever a new value is written to an indicated non-volatile memory cell to indicate an alternate memory cell to be written to next and an alternate memory cell to be read from next.

2. The storage system according to claim 1 including first and second non-volatile memory cells and first and second flag cells associated with said first and second non-volatile memory cells.

3. The storage system according to claim 2 wherein said means for changing said current data set includes means for alternately changing managing data in said first and second flag cells.

4. The storage system according to claim 2 wherein said means for changing said current data set includes means for alternately writing managing data to one of said flag cells.

5. The storage system according to claim 2 wherein said means for changing said current data set includes means for alternately erasing managing data from one of said flag cells.

6. The storage system according to claim 2 wherein said means for changing said current data set includes means for writing managing data to one of said flag cells.

7. The storage system according to claim 2 wherein said means for changing said current data set includes means for erasing managing data from one of said flag cells.

8. The storage system according to claim 2 wherein said managing data stored in said first flag cell includes a logic value of 0 or 1 and said managing data stored in said second flag cell includes a logic value of 0 or 1.

9. The storage system according to claim 8 wherein said current data set is selected from a group of data sets consisting of a first data set including managing data of 0 stored in said first flag cell and 0 stored in said second flag cell; a second data set including managing data of 0 stored in said first flag cell and 1 stored in said second flag cell; a third data set including managing data of 1 stored in said first flag cell and 1

in said second flag cell; and a fourth data set including managing data of 1 stored in said first flag cell and 0 in said second flag cell.

10. The storage system according to claim 9 wherein said current data set is said first data set.

11. The storage system according to claim 10 wherein said means for changing said first data set includes means for changing said first data set to said second, third and fourth data sets, respectively.

12. The storage system according to claim 10 wherein said means for changing said current data set includes means for repeatedly changing said current data set.

13. The storage system according to claim 12 wherein said means for changing said current data set includes means for cyclically changing said current data set.

14. The storage system according to claim 2 further comprising means for writing said new value to one of said first and second non-volatile memory cells and means for reading said currently stored value from the other of said first and second non-volatile memory cells.

15. The storage system according to claim 2 further comprising means for erasing one of said non-volatile memory cells.

16. The storage system according to claim 2 wherein said current data set is included in a group of different current data sets and said means for changing said current data set further include means for changing said current data set to one of said group of different current data sets.

17. The storage system according to claim 16 wherein said group of different current data sets is equally divided in number between those current data sets indicating writing said new value to said first non-volatile memory cell and between those current data sets indicating writing said new value to said second non-volatile memory cell.

18. The storage system according to claim 17 wherein said means for changing said current data set includes means for changing said current data set to a different one of said group of different current data sets each time said current data set is changed.

19. The storage system according to claim 16 wherein said means for changing said current data set includes means for changing said data set to a different one of said group of different current data sets each time said current data set is changed.

20. The storage system according to claim 1 wherein said means for changing said current data set includes means for repeatedly changing said current data set.

21. The storage system according to claim 20 wherein said means for changing said current data set includes means for cyclically changing said current data set.

22. The storage system according to claim 1 wherein said managing data of said plurality of flag cell is a logic value.

23. The storage system according to claim 1 further comprising means for reading said current data set.

24. The storage system according to claim 1 wherein said plurality of flag cells are memory cells.

25. The storage system according to claim 1 wherein said means for changing said current data set includes logic control means.

26. The storage system according to claim 1 wherein said plurality of non-volatile memory cells includes two non-volatile memory cells.

27. A method of managing a sequence of reading and writing in a storage system including an integrated circuit having a plurality of non-volatile memory cells and a plurality of flag cells storing managing data, said managing data of said plurality of flag cells forming a current data set, comprising the steps of:

a) utilizing said current data set to determine which one of said plurality of non-volatile memory cells

to write a new value to and which other of said plurality of non-volatile memory cells to read a currently stored value from;

b) reading said currently stored value of said one of said plurality of memory cells according to said current data set;

c) writing said new value to said other of said plurality of non-volatile memory cells according to said current data set and changing said current data set to a different current data set whenever a new value is written;

d) utilizing said different current data set to determine which one of said plurality of non-volatile memory cells to write another new value to and which other of said plurality of non-volatile memory cells to read another currently stored value from;

e) writing another new value to an alternate non-volatile memory cell according to said different current data set; and

f) reading another currently stored value from an alternate non-volatile memory cell according to said different current data set.

28. The method according to claim 27 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set.

29. The method according to claim 28 including first and second flag cells and first and second non-volatile memory cells.

30. The method according to claim 29 wherein changing said current data set includes alternately writing managing data to said first and second flag cells.

31. The method according to claim 29 wherein changing said current data includes alternately erasing managing data from said first and second flag cells on which data has been written.

32. The method according to claim 29 wherein changing said current data set includes writing managing data to one of said first and second flag cells.

33. The method according to claim 29 wherein changing said current data set includes erasing management data from said one of said first and second flag cells which has had data written to it.

34. The method according to claim 29 further comprising erasing both of said first and second flag cells before step a) occurs.

35. The method according to claim 34 wherein changing said current data set includes writing managing data to said second flag cell.

36. The method according to claim 35 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and wherein changing said current data set includes writing managing data to said first flag cell.

37. The method according to claim 36 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and wherein changing said current data set includes erasing managing data from said second flag cell.

38. The method according to claim 37 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and wherein changing said current data set includes erasing managing data from said first flag cell.

39. The method according to claim 29 wherein changing said current data set includes writing new managing data to or erasing currently stored managing data from one of said first and second flag cells.

40. The method according to claim 29 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and wherein changing said current data set includes writing managing data to one of said flag cells an equal number of times as said other flag cell.

41. The method according to claim 29 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and wherein changing said current data set includes writing managing data alternately to said flag cells.

42. The method of claim 29 further comprising changing said current data set to a different current data set from a group of different current data sets.

43. The method according to claim 42 further comprising equally dividing said group of different current data sets in number between those different current data sets indicating writing a new value to said first non-volatile memory cell and between those different current data sets indicating writing a new value to said second non-volatile memory cell.

44. The method according to claim 43 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and changing said current data set data to one of said group of different current data sets sequentially.

45. The method according to claim 44 further comprising changing said current data set to one of said group of different current data sets of said group of different current data sets cyclically.

46. The method according to claim 42 further comprising repeating steps c)-f) wherein said different current data set becomes said current data set and changing said current data set to one of said group of different current data sets an equal number of times as the current data set is changed to the other different current data sets upon repeating steps c)-f) the same number of times as there are different current data sets.

47. The method according to claim 29 wherein said current data set and said different current data set are selected from a group of current data sets consisting of a first data set storing logic values of 0 in said first flag cell and 0 in said second flag cell; a second data set storing logic values of 0 in said first flag cell and 1 in said second flag cell; a third data set storing logic values 1 in said first flag cell and 1 in said second flag cell; and a fourth data set storing logic values of 1 in said first flag cell and 0 in said second flag cell.

48. The method according to claim 47 wherein said current data set is said first data set and said different data set is said second data set.

49. The method according to claim 48 further comprising repeating steps c)-f) wherein said second data set is said current data set and said third data set is said different data set.

50. The method according to claim 49 further comprising repeating steps c)-f) wherein said third data set is said current data set and said fourth data set is said different data set.

51. The method according to claim 50 further comprising repeating steps c)-f) wherein said fourth data set is said current data set and said first data set is said different data set.

52. A method of managing a sequence of reading and writing in a storage system including an integrated circuit having a plurality of non-volatile memory cells and a plurality of flag cells storing managing data, said managing data of said plurality of flag cells forming a current data set said, comprising the steps of:

- a) utilizing said current data set to determine which one of said plurality of non-volatile memory cells to write a new value to and which other of said plurality of non-volatile memory cells to read a currently stored value from;

- b) reading said currently stored value of said other of said plurality of memory cells according to said current data set; and

- c) writing said new value to said one of said plurality of non-volatile memory cells according to said current data set and changing said current data set to a different current data set.

53. The method according to claim 52 further comprising repeating steps a)-c) wherein said different data set becomes said current data set.

54. The method according to claim 52 further comprising erasing said plurality of flag cells before step a).

55. The method according to claim 52 further comprising erasing said plurality of non-volatile memory cells before step a).

56. The method according to claim 52 wherein changing said current data set includes writing managing data to one of said plurality of flag cells.

57. The method according to claim 52 wherein changing said current data set includes erasing managing data from one of said plurality of flag cells to which data has been written.

58. The method according to claim 52 further comprising providing a sequence of data sets and changing said data set to a data set after the next data set in the sequence.